



//1. PRODUTOS NOTÁVEIS

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$$

$$(a + b)(a - b) = a^2 - b^2$$

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

$$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$$

$$(a - b)^3 = a^3 - b^3 - 3ab(a - b)$$

//2. FATORAÇÃO

$$ab + ac = a(b + c)$$

$$ab + ac + bd + cd = a(b + c) + d(b + c) = (b + c)(a + d)$$

$$a^2 - b^2 = (a + b)(a - b)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$x^n - a^n = (x - a)(x^{n-1} + x^{n-2}a + \dots + xa^{n-2} + a^{n-1})$$

$$x^n + a^n = (x + a)(x^{n-1} - x^{n-2}a + \dots - xa^{n-2} + a^{n-1})$$

$$a^4 + 4b^4 = (a^2 + 2ab + 2b^2)(a^2 - 2ab + 2b^2)$$

$$x^4 + x^2 + 1 = (x^2 + x + 1)(x^2 - x + 1)$$

//3. PROGRESSÃO ARITMÉTICA

$$a_{n+1} - a_n = r$$

Crescente: $r > 0$
 Constante: $r = 0$
 Decrescente: $r < 0$

$$a_n = \frac{a_{n-1} + a_{n+1}}{2}$$

$$a_n = a_1 + (n - 1)r$$

$$S_n = \frac{(a_1 + a_n)n}{2}$$

//4. PROGRESSÃO GEOMÉTRICA

$$a_{n+1} = a_n \cdot q$$

Crescente: $q > 1$
 Constante: $q = 1$
 Decrescente: $0 < q < 1$
 Alternante: $q < 0$

$$a_n = \sqrt{a_{n-1} \cdot a_{n+1}}$$

$$a_n = a_1 q^{n-1}$$

$$q \neq 1 \Rightarrow S_n = \frac{a_1(q^n - 1)}{q - 1}$$

$$q = 1 \Rightarrow S_n = na_1$$

$$P_n = a_1^n q^{\frac{n(n-1)}{2}}$$



//5. ANÁLISE COMBINATÓRIA

5.1. O princípio multiplicativo

Supondo que um evento E possa ser decomposto em r eventos ordenados $E_1, E_2, \dots, E_r$ e que existam.

n_1 maneiras para o evento E_1 ocorrer

n_2 maneiras para o evento E_2 ocorrer

n_r maneiras para o evento E_r ocorrer

Então o número de maneiras do evento E ocorrer é dado por

$$n_1 \times n_2 \times \dots \times n_r = \prod_{i=1}^r n_i$$

5.2. Permutação simples

$$P_n = n!$$

5.3. Permutação com repetição

$$P_n^{a, b, \dots, c} = \frac{n!}{a! \cdot b! \cdot \dots \cdot c!}$$

5.4. Permutação circular

$$PC_n = P_{n-1} = (n-1)!$$

5.5. Arranjos simples

$$A_n^p = \frac{n!}{(n-p)!}$$

5.6. Combinação simples

$$C_n^p = \frac{n!}{p!(n-p)!}$$

//6. PROBABILIDADE

6.1. Probabilidade de um evento A

$$P(A) = \frac{\text{número de casos favoráveis}}{\text{número de casos possíveis}} = \frac{\#(A)}{\#(U)} = \frac{m}{n}$$

Para todo evento A, $0 \leq P(A) \leq 1$;

$P(U) = 1$;

$P(\emptyset) = 0$ (porque $\#(\emptyset) = 0$);

Se $A \cap B = \emptyset$ então $P(A \cup B) = P(A) + P(B)$.

Se $A \cap B \neq \emptyset$ então $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

6.2. Probabilidade do evento complementar

$$P(A^c) = 1 - P(A)$$

//7. GEOMETRIA PLANA

7.1. Soma dos ângulos internos de um polígono

$$S_i = 180^\circ(n-2)$$

7.2. Soma dos ângulos externos de um polígono

$$S_e = 360^\circ$$

7.3. Diagonais que partem de um vértice

$$d = (n-3)$$

7.4. Total de diagonais

$$D = \frac{n(n-3)}{2}$$

7.5. Diagonais que passam pelo centro (gênero par)

$$D_c = \frac{n}{2}$$

7.6. Diagonais que passam pelo centro (gênero ímpar)

Nenhuma

7.7. Ângulo interno de um polígono regular

$$a_i = \frac{180^\circ(n-2)}{n}$$

7.8. Ângulo externo de um polígono regular

$$a_e = \frac{360^\circ}{n}$$

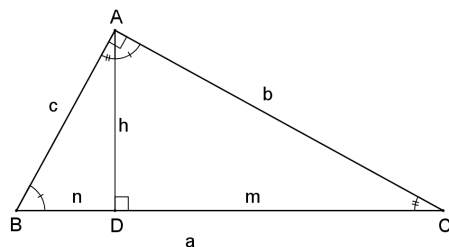
7.8. Teorema de Tales

Sejam as retas $r_1 \parallel r_2 \parallel r_3 \parallel \dots \parallel r_{n-1} \parallel r_n$, então

$$\frac{A_1 A_2}{B_1 B_2} = \frac{A_2 A_3}{B_2 B_3} = \dots = \frac{A_{n-1} A_n}{B_{n-1} B_n}$$



7.9. Relações métricas no triângulo retângulo



$$a \cdot h = b \cdot c$$

$$b^2 = a \cdot m$$

$$c^2 = a \cdot n$$

$$h^2 = m \cdot n$$

$$\frac{1}{h^2} = \frac{1}{b^2} + \frac{1}{c^2}$$

$$a^2 = b^2 + c^2$$

7.10. Triângulo equilátero

$$h = \frac{l\sqrt{3}}{2}$$

$$l_3 = R\sqrt{3}$$

$$a_3 = \frac{R}{2}$$

7.11. Quadrado

$$d = l\sqrt{2}$$

$$l_4 = R\sqrt{2}$$

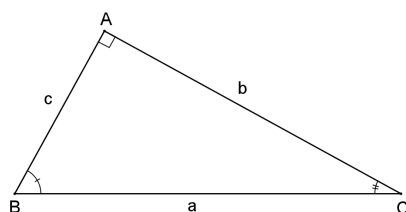
$$a_4 = \frac{R\sqrt{2}}{2}$$

7.12. Hexágono regular

$$l_6 = R$$

$$a_6 = \frac{R\sqrt{3}}{2}$$

7.13. Trigonometria no triângulo retângulo



$$\text{Seno: } \sin \hat{B} = \frac{\text{cateto oposto}}{\text{hipotenusa}} = \frac{b}{a}$$

$$\text{Cosseno: } \cos \hat{B} = \frac{\text{cateto adjacente}}{\text{hipotenusa}} = \frac{c}{a}$$

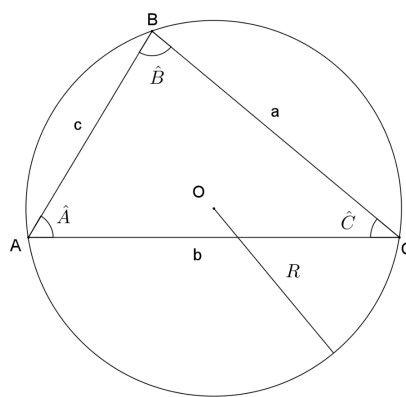
$$\text{Tangente: } \tan \hat{B} = \frac{\text{cateto oposto}}{\text{cateto adjacente}} = \frac{b}{c} = \frac{\sin \hat{B}}{\cos \hat{B}}$$

$$\text{Cotangente: } \cotg \hat{B} = \frac{\text{cateto adjacente}}{\text{cateto oposto}} = \frac{c}{b} = \frac{\cos \hat{B}}{\sin \hat{B}} = \frac{1}{\tan \hat{B}}$$

$$7.14. \text{Secante: } \sec \hat{B} = \frac{1}{\cos \hat{B}}$$

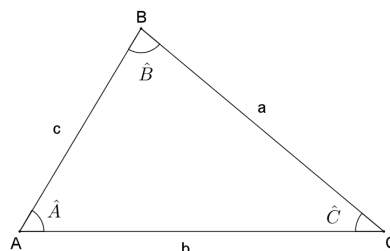
$$7.15. \text{Cossecante: } \text{cossec } \hat{B} = \frac{1}{\sin \hat{B}}$$

7.16. Lei dos senos



$$\frac{a}{\sin \hat{A}} = \frac{b}{\sin \hat{B}} = \frac{c}{\sin \hat{C}} = 2R$$

7.17. Lei dos cossenos



$$a^2 = b^2 + c^2 - 2bc \cdot \cos \hat{A}$$

7.18. Síntese de Clairaut

$$\triangle ABC \text{ é acutângulo} \Leftrightarrow a^2 < b^2 + c^2$$

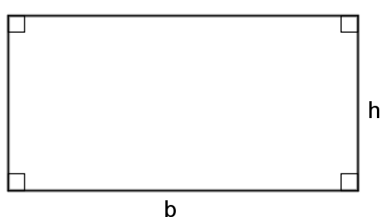
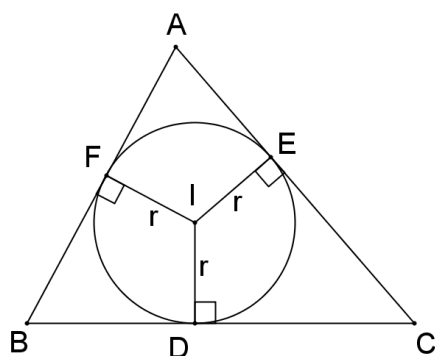
$$\triangle ABC \text{ é retângulo} \Leftrightarrow a^2 = b^2 + c^2$$

$$\triangle ABC \text{ é obtusângulo} \Leftrightarrow a^2 > b^2 + c^2$$



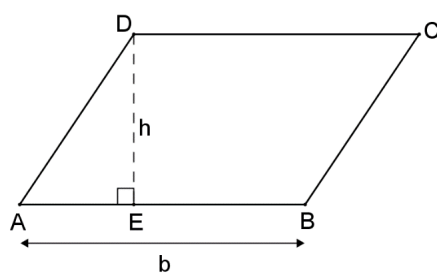
//8. ÁREAS

8.1. Retângulo



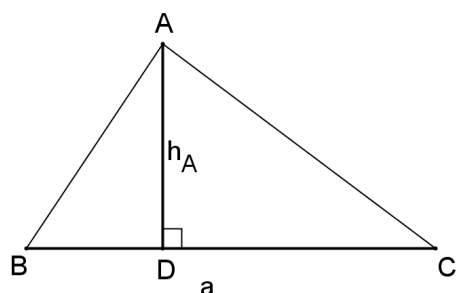
$$S = b \cdot h$$

8.2. Paralelogramo

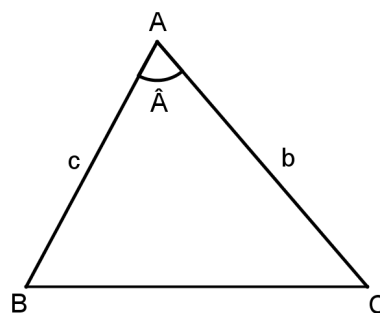


$$S = b \cdot h$$

8.3. Triângulos

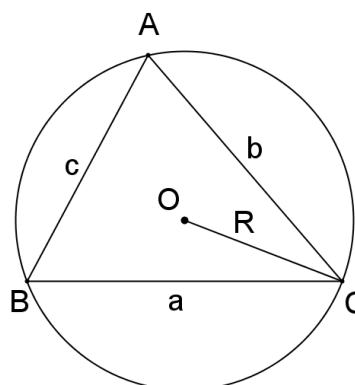


$$S_{ABC} = \frac{a \cdot h_A}{2} = \frac{b \cdot h_B}{2} = \frac{c \cdot h_C}{2}$$

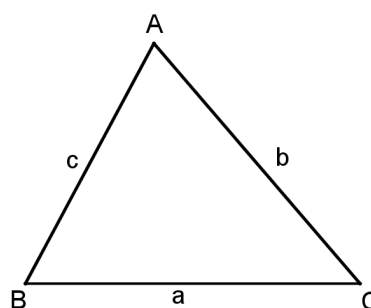


$$S_{ABC} = \frac{b \cdot c}{2} \sin \hat{A} = \frac{a \cdot c}{2} \sin \hat{B} = \frac{a \cdot b}{2} \sin \hat{C}$$

$$S_{ABC} = p \cdot r$$



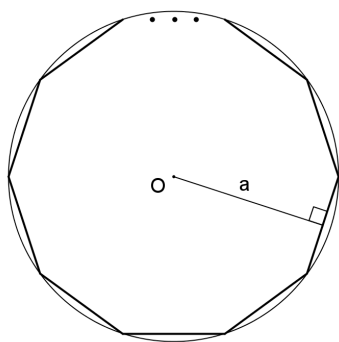
$$S_{ABC} = \frac{a \cdot b \cdot c}{4R}$$



$$S_{ABC} = \sqrt{p \cdot (p-a) \cdot (p-b) \cdot (p-c)}$$

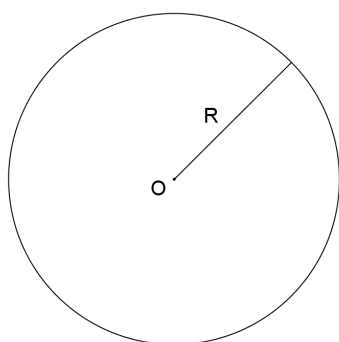


8.4. Polígono regular



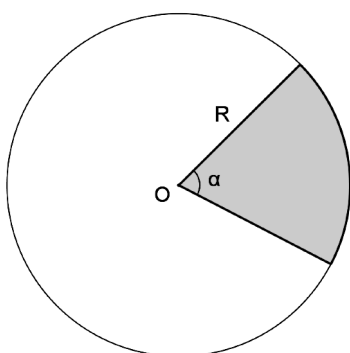
$$S = p \cdot a$$

8.5. Círculo



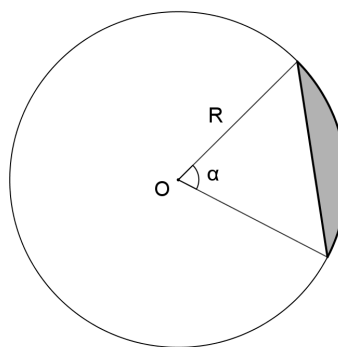
$$S = \pi \cdot R^2$$

8.6. Setor circular



$$S = \frac{\pi R^2 \cdot \alpha}{360}$$

8.7. Segmento circular



$$S_{\text{segmento } \alpha} = S_{\text{setor } \alpha} - S_{\text{triângulo}} = \frac{R^2}{2} \cdot (\alpha - \text{sen } \alpha)$$

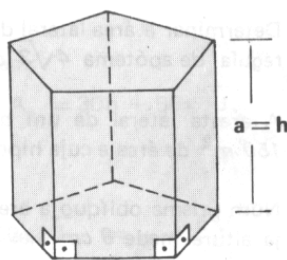
8.8. Paralelepípedo retângulo

diagonal:	$d = \sqrt{a^2 + b^2 + c^2}$
área total:	$S_T = 2 \cdot (ab + ac + bc)$
volume:	$V = a \cdot b \cdot c$

8.9. Cubo (hexaedro regular)

diagonal:	$d = a\sqrt{3}$
área total:	$S_T = 6a^2$
volume:	$V = a^3$

8.10. Prisma reto



$$S_B = 2p \cdot a_b$$

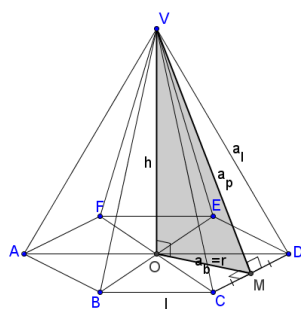
$$S_L = 2p \cdot h$$

$$S_T = 2p \cdot h + 2 \cdot S_B$$

$$V = S_B \cdot h$$



8.11. Pirâmide regular



$$a_l^2 = a_p^2 + R^2$$

$$a_p^2 = a_b^2 + h^2$$

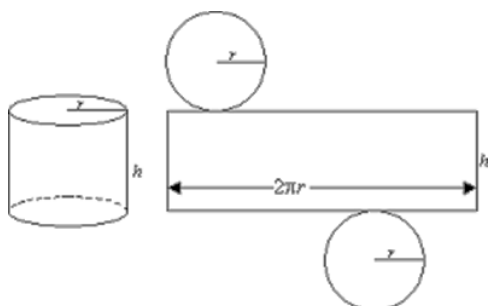
$$S_B = p \cdot a_b$$

$$S_L = p \cdot a_p$$

$$S_T = p \cdot a_p + S_B$$

$$V = \frac{1}{3} \cdot S_b \cdot h$$

8.12. Cilindro reto



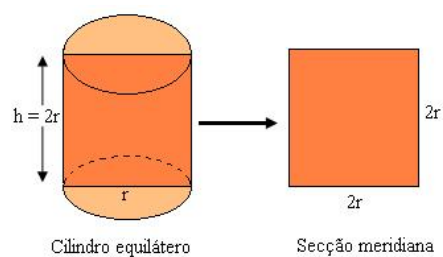
$$S_B = 2\pi r^2$$

$$S_L = 2\pi r h$$

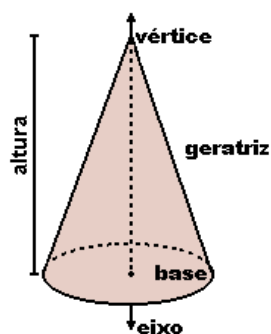
$$S_T = 2\pi r(r + h)$$

$$V = \pi r^2 h$$

8.13. Cilindro equilátero



8.14. Cone reto



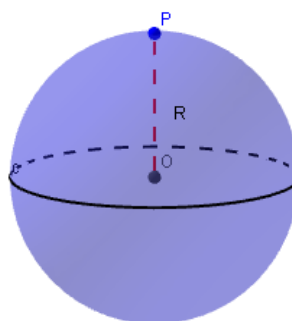
$$S_B = \pi r^2$$

$$S_L = \pi r g$$

$$S_T = \pi r(r + g)$$

$$V = \frac{1}{3} \cdot \pi r^2 \cdot h$$

8.15. Esfera

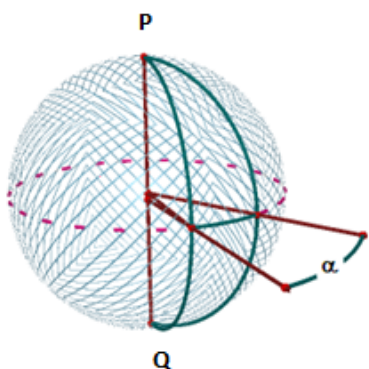


$$S_T = 4\pi R^2$$

$$V = \frac{4}{3} \cdot \pi R^3$$



8.16. Fuso e cunha esférica

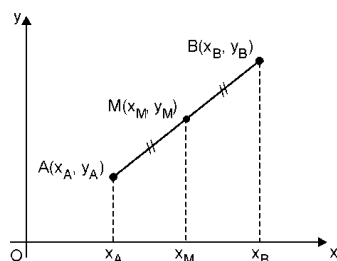


$$S_{\text{fuso}} = 2\alpha R^2$$

$$V_{\text{cunha}} = \frac{2}{3}\alpha R^3$$

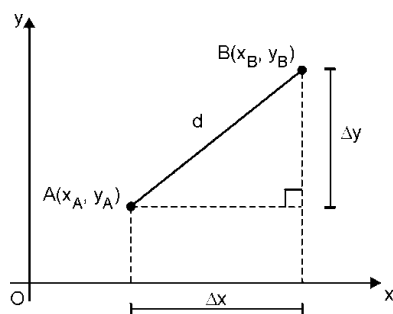
//9. GEOMETRIA ANALÍTICA

9.1. Ponto médio de um segmento



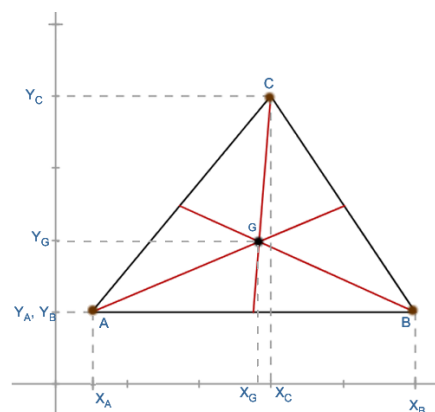
$$x_M = \frac{x_A + x_B}{2} \text{ e } y_M = \frac{y_A + y_B}{2}$$

9.2. Distância entre 2 pontos



$$d_{AB} = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

9.3. Baricentro do triângulo

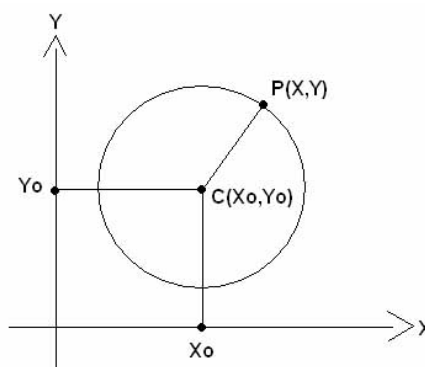


$$x_G = \frac{x_A + x_B + x_C}{3} \text{ e } y_G = \frac{y_A + y_B + y_C}{3}$$

Assim, o baricentro do triângulo ABC será:

$$G\left(\frac{x_A + x_B + x_C}{3}, \frac{y_A + y_B + y_C}{3}\right)$$

9.4. Circunferência



$$(x - x_0)^2 + (y - y_0)^2 = R^2$$

9.5. Equação completa

$$Ax^2 + By^2 + Cx + Dy + Exy + F = 0$$

$$\begin{cases} x_0 = -\frac{B}{2} \\ y_0 = -\frac{C}{2} \\ x_0^2 + y_0^2 - R^2 = D \end{cases}$$